

In the Claims

Please add the following new claims.

35. A method for forming an etched silicon layer comprising:

providing a first substrate having formed thereover a first silicon layer;

etching the first silicon layer to form an etched first silicon layer while

employing a plasma etch method employing a plasma reactor chamber in

5 conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active

chlorine containing etchant species, wherein within the plasma etch method:

5-207 (1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein
10 the seasoning method is a waferless seasoning method employing a bromine and/or chlorine containing etchant gas;

(2) the first silicon layer is etched to form the etched first silicon layer within the seasoned plasma reactor chamber; wherein the first silicon layer etch step, when using an eight inch diameter substrate, employs:

15 a reactor chamber pressure of from about 1 to 500 mTorr;

a radio frequency source power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz and an external bias power of up to about 500 watts;

a substrate temperature and a seasoned plasma reactor chamber temperature
20 of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of

25 from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss; and

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(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first silicon layer to form the etched first silicon layer within the seasoned plasma reactor
30 chamber prior to etching a second substrate having formed thereover a second silicon layer to form an etched second silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

36. A method for forming an etched monocrystalline silicon layer comprising:

providing a first substrate having formed thereover a first monocrystalline silicon layer;

etching the first monocrystalline silicon layer to form an etched first
5 monocrystalline silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active chlorine containing etchant species, wherein within the plasma etch method:

10 (1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is a waferless seasoning method employing a bromine and/or chlorine containing etchant gas;

15 (2) the first monocrystalline silicon layer is etched to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber; wherein the first monocrystalline silicon layer etch step, when using an eight inch diameter substrate, employs:

a reactor chamber pressure of from about 1 to 500 mTorr;

20 a radio frequency source power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz and an external bias power of up to about 500 watts;

a substrate temperature and a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

25 an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss; and

30 (3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first monocrystalline silicon layer to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate

having formed thereover a second monocrystalline silicon layer to form an etched
35 second monocrystalline silicon layer formed over the second substrate within the
plasma reactor chamber while employing the plasma etch method in accord with (1),
(2) and (3).

37. A method for forming an etched polycrystalline silicon layer comprising:

providing a first substrate having formed thereover a first polycrystalline
silicon layer;

etching the first polycrystalline silicon layer to form an etched first
polycrystalline silicon layer while employing a plasma etch method employing a
plasma reactor chamber in conjunction with a plasma etchant gas composition which
upon plasma activation provides an active bromine containing etchant species,
wherein within the plasma etch method:

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned
plasma reactor chamber having a seasoning polymer layer formed therein; wherein
the seasoning method is a waferless seasoning method employing a bromine and/or
chlorine containing etchant gas;

(2) the first polycrystalline silicon layer is etched to form the etched first
polycrystalline silicon layer within the seasoned plasma reactor chamber; wherein
15 the first polycrystalline silicon layer etch step, when using an eight inch diameter
substrate, employs:

a reactor chamber pressure of from about 1 to 500 mTorr;

a radio frequency source power of from about 10 to 2000 watts at a source
radio frequency of from about 2 to 13.56 MHz and an external bias power of up to
20 about 500 watts;

a substrate temperature and a seasoned plasma reactor chamber temperature
of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of
from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss; and

(3) the seasoning polymer layer is cleaned from the seasoned plasma
30 reactor chamber to provide the cleaned plasma reactor chamber after etching the first
polycrystalline silicon layer to form the etched first polycrystalline silicon layer
within the seasoned plasma reactor chamber prior to etching a second substrate
having formed thereover a second polycrystalline silicon layer to form an etched
second polycrystalline silicon layer formed over the second substrate within the
35 plasma reactor chamber while employing the plasma etch method in accord with (1),
(2) and (3).

Remarks

Examiner Goudreau is thanked for the thorough Office Action.